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ABSTRACT

DIALOG, an interactive, computer-based information retrieval language, consists of a series of computer programs designed to make use of direct access memory devices in order to provide the user with a rapid means of identifying records within a specific memory bank. Using the system, a library user can be provided access to sixteen distinct and extensive data banks. Examining four San Francisco Bay Area public libraries, a study, DIALIB, was conducted in an effort to answer the following question: Will the computerized search be wholly adopted by the public library, will there arise a private search service, or will a system of limited public access develop? The first year of the study shows that the library's capacity to do in-depth research in diverse fields has been expanded, especially in libraries that do not have a large reference collection. The computer search has also shown to be more cost effective than the manual search. The first year of the study has shown that the public is interested; the second year will attempt to discern whether the public is willing to pay for those services. (EMH)

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2ND USA-JAPAN COMPUTER CONFERENCE

PROVIDING THE PUBLIC WITH ONLINE ACCESS TO LARGE BIBLIOGRAPHIC DATA BASES*

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The DIALIB experiment extends the availability of online access to large bibliographic data bases directly to the public through the public library system. Four public libraries in Northern California are using the DIALOGTM online retrieval system to provide dial-up telephone access to 18 major scientific, social sciences, and business data bases. This paper describes the first year of the study which provides the participating libraries with free search time to determine whether such service can be of use to the general public. In the second year, service will be provided at one-half the normal cost to determine whether the libraries can financially support online retrieval through some combination of internal budgets and user fees. The planning for this second year is also described.

DESCRIPTION OF THE STUDY

A decade ago, online access to large bibliographic data bases was restricted to large governmental organizations that had the financial assets needed to prepare large data bases and to access them in an efficient manner. As a result of reduced computer and communication costs, this access broadened to industrial users and to universities over the past several years (1) and now, finally, an experiment in the United States brings such access directly to the public through the public library system.

The purpose of the DIALIB study is to probe the utility of the public library as a "linking agent" to the many machine-readable data bases now available. Because individuals and small organizations are unable to afford the capital cost of a computer terminal (\$3000 to \$5000) and the attendant training in the access language, the public library appears to be a suitable location to service the general public in this regard. The basic questions to be probed in the study are:

- Is computerized retrieval of use to the general public?
- Will the public be willing to pay to defray part or all of the cost?
- What impact will retrieval terminals have on the public as well as the library?

A 2-year experiment was established by the Office of Science Information Service (OSIS) of the National Science Foundation (NSF) to investigate these questions. For the first year of operation, the terminals, search time, and demonstration time are available at no cost to the libraries to familiarize the library staff with online retrieval and to determine whether the service is of use to the public. (The libraries pay the telephone line charges.) For the second year of operation, the terminals and demonstration time are again provided free, but a portion of the cost of the search time is billed to the libraries, with the NSF paying the balance. Some combination of internal library budget

and patron fees was to be used to meet these costs. By the third year of operation, the library will be expected to pay for the full cost of the terminals and search time. (As will be indicated in another section, search time normally costs approximately \$1 per minute; a typical search costs from \$10 to \$35.)

The Cooperation Information Network (CIN), an information sharing cooperative in the San Francisco Bay area consisting of both private and public libraries, selected the public libraries that were to participate, and the Lockheed Information System provided the project coordination and the DIALOGTM online retrieval service (2). The study is being evaluated by Applied Communications Research (ACR) of Palo Alto, California, an independent evaluation subcontractor.

In June 1974, CIN selected four libraries for the terminal locations, with each library representing a somewhat different type of library service; a large city (San Jose), a county library in a suburban area (Santa Clara County library, Cupertino), a county library with no walk-in traffic (San Mateo County library, Belmont), and a smaller city library with much walk-in business (Redwood City).

Librarians from each of the four participating libraries were given a 2-day training course at Lockheed, and spent about 1 month familiarizing themselves with the system. A large amount of publicity was generated by the official opening ceremonies in August 1974, and diverse publicity materials were developed. In addition, the participating libraries publicized availability of the retrieval service by demonstrations held in various branch libraries and at meetings of professional and social organizations. A portable terminal was shared for this purpose.

1. MECHANICS OF SEARCH

A terminal acoustically coupled to the telephone line was installed in three of the participating libraries. A teletype terminal was used in the fourth library. Although this type of terminal is noisy and has a high line cost, it is often available at member libraries of CIN, and can be quite useful for libraries that plan to make infrequent use of the system.

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The acoustically coupled terminal was chosen for its ability to make multiple copies, and because of its quietness. Although this terminal was acceptable in two of the libraries, it was too noisy for the room acoustics of the Redwood City library and a special soundproof enclosure had to be built for it.

The librarian can access 16 data bases including NTIS, INSPEC, Chemical Abstracts Condensates, Engineering Index, Social Sciences Citation Index, ERIC, Psychological Abstracts, Abstracted Business Information, and the National Agricultural Library bibliography. (See fig. 1.) Search terms are entered via a typewriter keyboard; the DIALOGTM system responds with an indication of the number of document citations in the data base that satisfy the request. Boolean combinations of terms, such as SULPHUR AND LOADING are used to refine the search. (The other Boolean relationships are OR, NOT.) In addition, the user can "expand" a term to obtain a display of alphabetically close terms. Desired references can be printed out either online or offline at the computer center. (See fig. 2 for a typical search.)

2 EXPERIENCE TO DATE

2.1 Use of the DIALIB system

Table 1, for the first 10 months of DIALIB operation, indicates the totals for number of searches and search hours, the number of searches and search and demonstration hours for a recent month, and the average offline and online time per search. One of the most striking aspects of these statistics is the wide variation from library to library. For example, San Mateo County required an average of 13 minutes of online time per search while Santa Clara County required 41 minutes per search. Some of the factors that can cause such differences are (a) whether the patron is physically present at the time of search, (b) the training and experience of the librarian, (c) the attitude of the librarian toward the system, (d) whether the request is from a branch library or directly from a patron, (e) differences in types of questions due to differences in the interests of patrons from region to region, and (f) the type of terminal being used (standard versus teletype).

These factors will be evaluated in future ACR reports, and an attempt will be made to relate them to search effectiveness as evidenced by patron satisfaction. For more detailed statistics of the first 10 months of operation, see Ahlgren (3).

2.2 Impact on the libraries

The computerized reference service has taken more librarian time than expected due to the number of patrons attracted by publicity concerning the service, and because the off-terminal time required is larger than the libraries expected. This has caused special difficulties at a time when library budgets have been severely limited. For example, the San Jose library, located close to the state university, found itself unable to handle requests from university students and attempted to limit such use. When citizen objections caused them to drop these limitations, they requested City Council permission to drop their involvement in DIALIB. Because it was felt that an important service was being rendered to the public, the City Council rejected this request. The library finally solved its problem by using a graduate student from the University's library school to operate the terminal. This student works for 6 hours a week handling student requests and received university credit for the service.

The libraries have begun to realize that they are now attracting a new class of patrons, people who previously did not perceive the public library as a source of answers to complex reference questions. For example, the library is now able to answer the somewhat technical questions posed by government, such as:

- What are the dangers of PCV pipes in a burning building? (Fire Department)
- What are the safety factors in loading dry sulphur? (Port Authority)
- What are some experiences with redevelopment financing? (Mayor's office)
- What are some experiences in patrol car maintenance? (Police Department)

2.3 Impact on the public

A remarkably diverse set of questions has been posed, ranging from agriculture to parapsychology, as indicated by the selection of search titles given in fig. 3. After the first year of operation, it has been found that most of the users are technical professionals and students, and that the users are highly educated (60% of the users have some graduate work and over 40% have advanced degrees). They use the service as part of their job or for a research paper, and 70% of the patrons felt that the results of a DIALOG search were of considerable or major value. Detailed analysis of user reaction can be found in (3).

2.4 Impact on the staff

Most of the librarians quickly adapted to the use of the terminal. They react differently, however, both to the large number of patrons attracted to the service, and to the more demanding nature of this new class of patron. Such patrons can require more of the reference librarian's time, and are often more critical of the results than the usual reference patron. The librarians are impressed by their enhanced ability to deal with questions that would have previously been rejected as beyond the abilities of the library. A discussion of the DIALIB project from the reference librarian's point of view is given in (4).

3 COST OF COMPUTERIZED SEARCH

A crucial part of the study is the question of whether computerized search can be financially supported by the public library, after the National Science Foundation support is removed. Some of the cost elements that enter are as follows.

The terminal. An acoustically coupled terminal with keyboard input and hardcopy output (to allow for multiple copies) leases for \$150 to \$215 a month. If available, a TWX teletype machine can be used.

Communications costs. For remote users, the Tymshare, Inc., network is available at a cost of \$10 an hour. The user places a call to the local Tymshare office and is connected to the DIALOGTM system. For local users, the cost of a telephone call to Palo Alto varies from \$1 to \$3 an hour depending on the rate zone. If TWX is used, the average cost is \$10.50 an hour within the local area.

Search costs. Because each data base supplier leases his data base for a different price, the cost of search time varies accordingly. Most of the data bases fall into the range of \$40 to \$60. In addition, offline prints of citations are billed at a rate of 10 cents an item.

Scientific and Technical Data Bases

- NTIS - The complete Government Reports/Announcements file from the National Technical Information Service. Over 400,000 abstracts of government research from over 240 agencies including NASA, DDC, AEC, HEW, HUD, DOT, Commerce, and many others.
- INSPEC (SCIENCE ABSTRACTS) - 700,000 abstracts from the Institution of Electrical Engineers; covers from 1969 to present. INSPEC data bases include: Physics Abstracts, Electrical and Electronics Abstracts, and Computers and Control Abstracts.
- CHEMICAL ABSTRACTS CONDENSATES - Some 600,000 records from the Chemical Abstracts Service covering 1972 to present.
- NAL/CAIN - Over 500,000 citations. the complete Bibliography of Agriculture file from the National Agricultural Library, including the contents of the NAL catalog as well. Over 475,000 citations of agriculture related material. File growth is at a rate of 140,000 citations per year. File coverage is from 1970 to present and includes the recently added Food and Nutrition file.
- COMPENDEX (ENGINEERING INDEX) - Over 200,000 citations and abstracts from 3,500 journals, publications of engineering organizations, and selected government reports and books; published world-wide.
- BIOSIS (Biosciences Information Service) - Over 800,000 citations from Biological Abstracts and Biosearch Index covering biological literature from 1972 to the present.
- CLAIMSTM (IFI/Plenum Data Co.) - Over 350,000 U.S. chemical and chemically related patents issued since 1950, plus foreign equivalents from Europe.

Educational, Psychological, and Business Data Bases

- ERIC - The complete file of educational materials from the Educational Resources Information Center of the National Institute of Education and other sources with 70,000 abstracts of Educational Research in the areas of curriculum development, learning disabilities, educational technology, and others and 68,000 abstracts of journal articles in education.
- EXCEPTIONAL CHILDREN ABSTRACTS - 12,000 abstracts of material of particular interest in this field.
- ABSTRACTS OF INSTRUCTIONAL AND RESEARCH MATERIALS (AIM/ARM) - 7,000 abstracts of instructional and research materials.
- PSYCHOLOGICAL ABSTRACTS - Over 150,000 abstracts to journal articles in psychology.
- ABSTRACTED BUSINESS INFORMATION (ABI/INFORM) - Over 14,000 abstracts from business and financial journals in the areas of management, administration, finance, etc.
- F&S (FUNK & SCOTT) INDEX - Domestic and international company, product, and industry information from over 1000 financial publications; business-oriented newspaper, trade magazines, and special reports.
- CHEMICAL AND ELECTRONIC MARKET ABSTRACTS (CMA/EMA) - Over 45,000 abstracts of domestic and foreign information on all chemical process and electronics and data processing equipment industries, 1972 to present.
- SOCIAL SCIENCES CITATION INDEX (SSCI) - Over 300,000 citations of social and behavioral science journal literature.
- Domestic Statistics File (Predictcasts) - 16,000 significant economic and industrial time series for 1960 to 1973, forecasts to 1985 for 1000 key series, and 140,000 forecasts from articles.

Fig. 1. Data bases available in DIALOGTM

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The patron is interested in references to harmful food additives. The librarian selects the National Agricultural Library Data Base that has a Food and Nutrition file.

<u>Set Numbers</u>	<u>No. in Set</u>	<u>Set description</u>	
7 SELECT FOOD ADDITIVES			
1	81	FOOD ADDITIVES	} The set of references pertinent to the term "food additives" is first selected. (There are 81 such citations.)
7 SELECT HARMFUL			
2	184	HARMFUL	} Sets pertinent to the terms "harmful," "dangerous," and "deleterious" are selected. (Sets 2, 3, and 4, respectively.)
7 SELECT DANGEROUS			
3	129	DANGEROUS	
7 SELECT DELETERIOUS			} Finally, the librarian combines the set by ANDing Set 1 with the set formed by ORing Sets 2, 3, and 4. The resulting Set 5 has 7 citations relevant to the concept "harmful food additives."
4	14	DELETERIOUS	
7 COMBINE 1 AND (2 OR 3 OR 4)			
5	7	1 AND (2 OR 3 OR 4)	
7 TYPE 5/2/1-7			

The library has requested that these seven citations be typed out at the terminal, and one such citation is given below. The librarian could have requested that these citations be printed offline and mailed to the library. This is often done when many citations are to be printed.

TX533.M37 F&N ID NO. - 73-9364380 001650
 FOOD POLLUTION: THE VIOLATION OF OUR INNER ECOLOGY
 MARINE, GENE; VAN ALLEN, JUDITH
 NEW YORK, HOLT, RINEHART AND WINSTON 385 p. 1972
 DESCRIPTORS- ADDITIVES AND ADULTERANTS, FOOD-RELATED DISORDERS,
 FOOD STANDARDS AND LEGISLATION, PESTICIDE RESIDUES, FOOD TECHNOLOGY,
 FOOD AND DRUG ADMINISTRATION, CANCER, FOOD FADS, FOOD ADDITIVES

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Fig. 2. A typical DIALOG™ search.

Table 1
 Search statistics for participating libraries

	<u>Libraries</u>			
	<u>San Mateo County</u>	<u>Redwood City</u>	<u>San Jose</u>	<u>Santa Clara County</u>
Total searches Jul 74 - Mar 75	319	421	292	204
Total search hours, Jul 74 - Mar 75	71 hrs	159 hrs	125 hrs	141 hrs
Average time per search	13 min	23 min	25 min	41 min
Number of searches, Mar 75	66	70	50	42
Search hours, Mar 75	10.5 hrs	20 hrs	21 hrs	25 hrs
Demonstration hours, Mar 75	3 hrs	7 hrs	0.3 hrs	0.6 hrs
Average off-line preparation time per search*	16 min	6 min	11 min	33 min

*ACR is currently studying the average offline preparation time in some detail, because it is felt that the preliminary figures given in Table 1 are far too low.

- Psychology
 - Child abuse
 - Meditation
 - Art therapy
 - Behavioral approaches to counseling
 - Mental health
 - Behavior therapy/marriage
- Education
 - Accreditation
 - Learning disabilities
 - Bilingual education
 - Parent participators
 - Science instruction
- Biology/medicine
 - Abiogenesis
 - Cellulose from protein
 - Protein gel
 - Cocaine
 - Antibiotics
 - RH incompatibility
- Law
 - Crime and theories of gun control
 - Parliamentary law
- Engineering/Science
 - Computerized data banks
- Mining
 - Associative memories-computers
 - Thin film magnetic tapes
 - Computer output microfilm
 - Boat building industry
 - Plastics processing
 - Hydrogen production
 - Concrete water tanks
 - Ion beam processing
 - Auger spectroscopy
 - Microspheres
 - Natural gas
 - Hydrogen production
 - Parabolic antenna
- Social Services/Government
 - Recycling paper
 - Technology transfer
 - Noise pollution
 - Speaker credibility
 - Zero population
- Agricultural
 - Cattle feed - algae
 - Rabbit breeding
 - Growing bananas

Fig. 3. Typical search titles grouped by general category.

Thus, depending on the amount of terminal cost to be distributed per search, the nature of the communication link used, and the data base selected, the cost of a 15 minute search could range from \$10 for a local library using a low-cost data base to \$20 for a remote library using one of the higher priced data bases. Assuming an average of two questions per day, with 15 minutes per question, this could cost from \$5000 to \$10,000 a year, and could require up to 240 hours of librarian time, including both the online and offline time.

Patron fees for service to support such costs have been used in the Minneapolis Public Library INFORM system (5), and in university libraries such as (6). Most public librarians view the introduction of fee for service with great trepidation and are concerned as to how to treat reference service for a fee in the same environment as free reference service (7). The following section describes the pricing policy to be used in the DIALIB project.

4 DIALIB PRICING POLICIES

4.1 Fees charged the libraries

At the inception of the DIALIB study, it was planned that, after the free 1-year period, the libraries would be charged one-half the usual DIALOG rate. Because this rate is based on actual connection time, the libraries expressed concern that the costs would be too high for most patrons. Therefore, an alternative pricing structure was developed by Lockheed, that of a "standard search," limited to a single data base, no more than 10 search sets, and 20 offline citation print-outs. This restricted form of search would be billed to the libraries at \$5 per search. The "custom search" was to be an unrestricted search charged to the libraries at one-half the normal charge based on connect time. Different passwords were to be used for a standard or custom search to handle the billing mechanics.

Because the libraries were concerned about the possibility of bad public relations from patrons who felt that they did not get their money's worth in search results, Lockheed proposed a system in which such patrons fill out a form indicating the reason for their displeasure. The library then returns the patron's money, and forwards the form to Lockheed for credit to the library's account.

4.2 Patron fees

By the terms of agreement between Lockheed and the participating libraries, the libraries were to determine the required pricing policy. That is, if they desired, they could use internal budget to pay for as much of the search costs as they desired. Because of severe budgetary pressures, the Pricing Policy Committee, consisting of the four head librarians, chose to pass the entire cost on to the patron; no internal budget was set aside for computerized search. This approach was somewhat of a disappointment to DIALIB's Oversight Committee (see Appendix B), who had hoped that at least a small amount of internal budget would be made available to serve those unable to pay for the service.

4.3 Reimbursement of libraries

Although the time expended by the libraries for the first year was below the original estimates, the budgetary pressures made it difficult for them to continue to support the terminal operation with trained reference librarians. For this reason, the Pricing Policy Committee requested that the librarians be reimbursed for time spent on the terminals for the first

6 months of the paying period to ease the transition problems. At the time of this writing, attempts are being made to provide this support.

CONCLUSIONS

The DIALIB study is interesting for what it indicates about the role of the public library in the future: Will computerized search be adopted by the libraries, will there arise a significant private search service market (8) or will access to large bibliographic data bases continue to be limited? Will the library be the place where a computer terminal is available for public use, not only for reference retrieval but also for access to computation (9) or for community information (10)?

Atkinson (11) indicates that many of these answers may depend on the public's perceptions of the role of the library in society. Observations in the DIALIB project indicate that the answers will also depend on how the librarians perceive their roles. The librarian who views his or her role as serving the community by actively soliciting reference questions will reflect policies different from those of the librarian who views the reference role in a more passive, traditional light.

The first year of the project has shown that computerized search allows the public library to offer in-depth search in diverse intellectual fields, and in fields in which the reference librarian is not expert. Computerized reference retrieval has been of great use to the public libraries that do not have a large reference collection. It also can be more cost effective than manual search for many topic areas even when a large reference collection is available. The public has shown great interest in the service and has expressed very positive evaluations toward the results obtained. We anxiously await the second year that will demonstrate whether or not the public is willing to pay for such services.

Appendix A

THE DIALOG™ RETRIEVAL SYSTEM

DIALOG™ an interactive, computer-based information retrieval language developed at the Lockheed Palo Alto Research Laboratory, consists of a series of computer programs which have been designed to make full use of direct access memory devices and display units to provide the user a rapid and powerful means of identifying records within a file which satisfy a particular information need. By providing the user full display access to the indexing vocabulary, and the ability to modify search expressions, DIALOG becomes a data processing extension of the human operator who directs and controls the process.

The user issues commands to the computer by way of a keyboard, and receives results on the display unit. DIALOG allows the user with a well-defined search topic to proceed directly to desired records: the user who cannot so explicitly define his requirement is provided tools for browsing through the file. It is thus possible to investigate successive avenues of interest as they arise or are suggested by intermediate retrieval results.

The search process is broken up into a sequence of small steps, each of which is very simple, and each of which results in feedback from the system. In this manner each step is completed correctly before proceeding, thus eliminating the need to reenter the entire search specification in case of an error.

EXPAND Provides a display of the alphabetically near index terms relative to the term entered. The number of citations indexed by the displayed term is also given. This feature eliminates the problem of variant spellings or of singular and plural forms, e.g., EXPANDING 'computer,' one can readily select additional terms such as 'computers,' and 'computing' from the display. This command can also be used to obtain conceptually related term for those data bases having a stored thesaurus.

SELECT The SELECT command results in the definition of file subsets (referred to as 'sets') which are tagged with "set numbers" and are printed out on the terminal hard copy device.

COMBINE COMBINE allows the searcher to combine any number of citation sets using the logical relationships AND, OR, NOT. Thus, 'Digital' AND 'Computers' will form the set of citations containing both the term 'Digital' as well as the term 'Computers,' while 'Digital' OR 'Computers' will form the set of citations that satisfy either 'Digital,' or 'Computers,' or both.

DISPLAY The DISPLAY command allows the user to review intermediate results in variation formats. The most frequently used format provides a display of the entire citation including all assigned descriptors and a descriptive abstract if available. Supplying the full citation not only enables the user to evaluate the relevancy of his search to that point, but it also shows alternative descriptors he can explore or can include (using the COMBINE command) with other previously developed categories.

PRINT The PRINT command allows the user to obtain listings of desired citations in an offline mode. Prints are prepared on the high-speed printer and mailed to the user.

Although this basic set of four commands will enable the user to perform useful searches, additional commands such as the 'full text' commands (allowing all nontrivial words in the title and abstract to be treated as search terms) provide the user with additional search power and flexibility. [See (2) for a more complete description of DIALOGTM commands.]

The DIALOG system is run on an IBM 360/65 computer having one million bytes of core storage. The direct access memory consists of one billion bytes of disk memory (IBM 3330 equivalent) and 3-1/2 billion bytes of datacell memory. Input to the system is via multiple ports consisting of high-speed leased lines (480 characters/second), direct-dialed lines (30 cps or 120 cps), Tymshare, Inc., lines (30 cps), and a TWX port (10 cps). The IBM operating (OS) is used to control the system, and the DIALOG retrieval software is written in assembly language, while many of the file preparation and accounting programs are written in PL/I.

Appendix B

THE OVERSIGHT COMMITTEE

Lockheed selected the following Oversight Committee of outside consultants to review the project. Their counsel and guidance has been invaluable to DIALIB.

Charles Bourne, Director, Institute of Library Research, University of California, Berkeley, California; Forrest F. Carhart, Jr. Executive Director, METRO: N. Y. Metropolitan Reference and Research Library Agency; Douglas Ferguson, Head, Data Information Services, Stanford University Libraries; Virginia Ross Geller, Geller and Ross Library Consultants,

Redwood, City, California; Albert H. Rubenstein, Professor, Industrial Engineering and Management Sciences, Northwestern University.

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